8. Water Intake

8.1 Introduction

Water serves as a vehicle not only for waterborne nutrients but also for chemical toxicants and microorganisms. Airborne substances can deposit directly on surface water bodies used for drinking water and other domestic activities. (Material carried in by surface run-off is not considered at this time.) The equation to calculate the water concentration in the Air Toxics "Hot Spots" risk assessment model is:

$$Cw = GLC * Dep\text{-}rate * 86{,}400 * SA * 365 / (WV * VC) \qquad \text{(Eq. 8-1)}$$

where:
- Cw = Average concentration in water (μg/kg)
- GLC = Ground-level concentration of the pollutant ($\mu g/m^3$)
- Dep-rate = Vertical rate of deposition (m/sec) (0.02 meters/second for controlled or 0.05 meters/second for uncontrolled sources.)
- 86,400 = Seconds per day conversion factor (sec/d)
- SA = Water surface area (m^2)
- 365 = Days per year (d/yr)
- WV = Water volume (kg) (1L = 1 kg)
- VC = Number of volume changes per year

Site-specific values for SA, WV, and VC values can be obtained from the applicable Department of Water Resources (DWR) Regional office. The equation assumes that all material deposited into the water remains in the water column and that the deposition rate remains constant for the 70-year exposure duration.

Assessing exposure to toxic substances in water requires knowledge of the actual intake in exposed populations. Extremes of intake in both normal and susceptible subpopulations are pertinent to both risk assessment and risk management. Facilities in the "Hot Spots" program with bodies of water used for drinking within their zone of impact need to evaluate this pathway of exposure. Defining both total water and tap water intakes in the subject populations is thus a key objective in many environmental risk assessments. Tap water usually includes water used directly for drinking and used in making cold and hot beverages. "Total water" would include tap water, water in food, bottled beverages, etc. There is some degree of overlap since tap water may be used in a local bottling plant for instance. Typically when estimating exposures via drinking water, risk assessors assume that children and adults ingest 1 and 2 liters of water per day, respectively (NAS, 1977). These values have been used in guidance documents and regulations issued by the U.S. Environmental Protection Agency. The purpose of this section is to briefly assess data on individual water consumption rates for possible use in stochastic types of exposure assessments that employ distributions of water intake. In addition, point estimates of intake on a body weight basis are taken off the distribution for use in the point estimate approach of Tier 1 and 2. The water ingestion algorithm is:

$$DOSEwater = 1E\text{-}3*Cw*WIR*ABSing*Fdw*EF*ED/AT \qquad \text{(Eq. 8-2)}$$

where:	DOSEwater =	daily oral dose of contaminant, mg/kg-d
	1E-6 =	conversion factor (1 mg/1000 μg) (1L/1000 mL)
	Cw =	Concentration of contaminant in drinking water, μg/L
	WIR =	Water intake rate for receptor of concern in mL/kg BW
	ABSing =	GI tract absorption factor (default = 100%)
	Fdw =	Fraction of drinking water from contaminated source (default = 100%)
	EF =	Exposure frequency (days/year)
	ED =	Exposure duration (years)
	AT =	Averaging time (period over which exposure is averaged, in days) for noncarcinogenic effects, AT = ED* 365 d/year; for carcinogenic effects, AT = 70 years*365 d/year = 25,500 d

8.2 Empirical Distributions

8.2.1 Exposure Factors Handbook (U.S. EPA, 1997)

In U.S. EPA's Exposure Factors Handbook (U.S. EPA, 1997), three key studies are identified which provide the basis for U.S. EPA's recommendations regarding water intake: Canadian Ministry of National Health and Welfare (1981), Ershow and Cantor (1989), and Roseberry and Burmaster (1992). These studies were selected based on the applicability of their survey designs to exposure assessment of the entire United States population. U.S. EPA selected a value of 1.41 L/day (21 mL/kg-day) as the recommended average tapwater intake rate for adults. This value is the population-weighted mean of the data from Ershow and Cantor (1989) and Canadian Ministry of National Health and Welfare (1981). U.S. EPA selected the average of the 90th percentile values from the same two studies (i.e., 2.35 L/day or 34.2 mL/kg-day), as the upper limit value. U.S. EPA notes that the commonly used intake rate of 2.0 L/day for adults corresponds to the 84th percentile of the intake rate distribution among the adults in the Ershow and Cantor (1989) study. For a mathematical description of intake distribution, U.S. EPA recommends using the data of Roseberry and Burmaster (1992) who fit lognormal distributions to the water intake data reported by Ershow and Cantor (1989) and estimated population-wide distributions for water intake based on proportions of the population in each age group. However, U.S. EPA cautions against using Roseberry and Burmaster (1992) for post-1997 estimates since these distributions only reflect differences in the age structure of the U.S. population between 1978 and 1988. In addition to intake rates for adults, U.S. EPA also provides a table of intake rates for children, by age category, also from Ershow and Cantor (1989) and Canadian Ministry of National Health and Welfare (1981).

OEHHA agrees with U.S. EPA in the choice of studies on which to base recommended intake rates and distributions for the general U.S. population. However, for the purposes of this document OEHHA chose to analyze a subset of the Ershow and Cantor (1989) data. OEHHA analyzed the data from the "Western Region" which is dominated by the population of California, since these data are more applicable to California and the "Hot Spots" program.

8.2.2 Ershow and Cantor (1989), Ershow et al. (1991)

The Ershow and Cantor (1989) and Ershow et al. (1991) studies are the most extensive analyses of the 1977-1978 Nationwide Food Consumption Survey (NFCS) data with respect to drinking water. All food and beverage sources, as well as drinking water, are incorporated in the estimates of total water intake. Estimates of tap water intake include drinking water and tap water added in final home or restaurant preparation of beverages and foods. Data are presented by age group, sex, season, and geographic region, and separately for pregnant women, lactating women, and breast-fed children. The study involved 26,081 participants. The average intake for all participants (except pregnant, lactating, breast-fed) was 2,072 ± 803 g/day of total water including 1,193 ± 702 g/day of tap water. The analyses are presented in 72 tables. The more important values are for: a) total water intake by age group for all participants, all regions, all seasons; b) tap water for the same; c) total water and tap water for all participants, all seasons, western region; and d) total water and tap water intakes for pregnant women, lactating women, and breast-fed children. These intake estimates, converted to mL/kg-d (assuming 1g = 1 mL), are summarized in Tables 8.1 through 8.5. In Table 8.1, the overall values (mean ± SD) for total water and tap water were 2,072 ± 803 and 1,193 ± 702 mL/day, respectively. The 90th and 95th percentiles of total water intake (not normalized to the subjects' body weight) were 3,098 and 3,550 mL/day, respectively. For tap water intake, the 90th and 95th percentiles are 2,092 and 2,477 mL/day, respectively. In Table 8.2 the same information is presented in units of mL/kg body weight/day. The body weights were self reported. In Table 8.3, the Western Regional data which are based on about 1/6 th of the total data set, are about 6% higher for mean ± SD: 2,206 ± 886 and 1,263 ± 764 mL/day for total water and tap water intakes, respectively. The 90th and 95th percentiles for total water intake (not normalized to the subjects' body weight) were 3,368 and 3,852 mL/day, respectively. The 90th and 95th percentiles for tap water intake are 2,219 and 2,680 mL/day, respectively. Table 8.4 presents the same information as Table 8.3 but in units of mL/kg body weight/day. Note that when these data are analyzed by normalizing water intake to body weight of subjects in the study, the traditional assumption of 2 liters for a 70 kg body weight corresponds to about the 75th percentile on Ershow and Cantor's distribution (Table 8.4, 0.28 mL/kg-day), while the value of 2 L/day not normalized to body weight is about the 90th percentile on the intake distribution. Table 8.5 summarizes the intake estimates for pregnant women, lactating women, and breast-fed children. Although the NFCS dataset has several limitations, as noted by the authors, it represents the largest and most relevant survey extant. Its overall results are quite similar to other smaller surveys conducted in Canada (n = 970) and the U.K. (n = 3564). There is no comparable dataset based solely on California residents.

Table 8.1 Water Intake Estimates From 1977-1978 NFCS in mL/day (Ershow & Cantor 1989)[a]

Age Group	N	50%	75%	90%	95%	$\bar{x} \pm$ SD
Total Water						
< 1	403	1120	1339	1597	1727	1148 ± 332
1-10	5,605	1497	1843	2236	2507	1559 ± 507
11-19	5,801	1874	2369	2908	3336	1989 ± 719
20-64	11,731	2109	2663	3318	3793	2243 ± 839
65+	2,541	2109	2616	3132	3482	2199 ± 728
All	26,081	1950	2485	3098	3550	2072 ± 803
All Males	11,888	2132	2719	3414	3903	2261 ± 888
All Females	14,193	1823	2299	2816	3166	1919 ± 691
Tap Water						
< 1		240	424	649	775	302 ± 258
1-10		665	960	1249	1516	736 ± 410
11-19		867	1246	1701	2026	965 ± 562
20-64		1252	1737	2268	2707	1366 ± 728
65+		1367	1806	2287	2636	1459 ± 643
All		1081	1561	2092	2477	1193 ± 702
All Males		1123	1634	2205	2673	1250 ± 759
All Females		1049	1505	1988	2316	1147 ± 648

[a] All Seasons, All Regions, pregnant, lactating and breast-fed excluded. Assumes 1 mL = 1 g as originally reported.

Table 8.2 Water Intake Estimates From 1977-1978 NFCS in mL/kg body weight/day (Ershow & Cantor, 1989)[a]

Age Group	**N**	**50%**	**75%**	**90%**	**95%**	$\bar{x} \pm$ **SD**
Total Water						
< 1		152.5	190.9	238.4	274.0	163.1 ± 63.3
1-10		69.2	92.0	117.7	135.5	75.3 ± 32.2
11-19		35.4	45.5	56.8	64.4	37.5 ± 14.5
20-64		30.7	39.1	48.8	56.1	32.6 ± 12.5
65+		31.4	39.4	47.7	54.6	32.9 ± 11.5
All		34.5	47.7	70.8	93.6	41.8 ± 27.4
All Males		35.3	49.7	75.2	98.6	43.3 ± 28.1
All Females		34.0	46.2	66.4	88.9	40.7 ± 26.8
Tap Water						
< 1		35.3	54.7	101.8	126.5	43.5 ± 42.5
1-10		30.5	46.0	64.4	79.4	35.5 ± 22.9
11-19		16.3	23.6	32.3	38.9	18.2 ± 10.8
20-64		18.2	25.3	33.7	40.0	19.9 ± 10.8
65+		22.3	27.1	34.7	40.0	21.8 ± 9.8
All		19.4	28.0	39.8	50.0	22.6 ± 15.4
All Males		18.9	27.9	40.2	52.0	22.5 ± 16.0
All Females		19.7	28.0	39.3	48.8	22.7 ± 15.0

[a] All Seasons, All Regions, pregnant, lactating and breast-fed excluded. Assumes 1 mL = 1 g as originally reported.

Table 8.3 Western Regional Water Intake Estimates in mL/day (Ershow & Cantor, 1989)[a]

Age Group	N	50%	75%	90%	95%	$\bar{x} \pm$ SD
Total Water						
< 1	68	1127	1321	1727	1866	1166 ± 359
1-10	849	1554	1972	2329	2580	1629 ± 536
11-19	884	1954	2504	3183	3594	2073 ± 779
20-64	1896	2246	2907	3645	4154	2409 ± 934
65+	383	2268	2767	3299	3706	2347 ± 727
All	4080	2070	2675	3368	3852	2206 ± 886
All Males	1856	2259	2937	3709	4152	2413 ± 950
All Females	2224	1916	2442	3071	3510	2037 ± 791

Tap Water						
< 1		276	517	754	—	362 ± 227
1-10		710	1042	1367	1564	782 ± 420
11-19		902	1299	1764	2143	992 ± 282
20-64		1322	1901	2489	2986	1452 ± 814
65+		1433	1881	2490	2794	1543 ± 629
All		1153	1645	2219	2680	1263 ± 764
All Males		1213	1737	2357	2867	1329 ± 799
All Females		1102	1576	2152	2530	1209 ± 730

[a] All seasons, pregnant, lactating, breast-fed excluded. Assumes 1 mL = 1 g as originally reported.

Table 8.4 Western Regional Water Intake Estimates in mL/kg body weight/ day[a]

Age Group	**50%**	**75%**	**90%**	**95%**	$\overline{X} \pm$ **SD**
Total Water					
< 1	149.9	196.9	264.0	———	168.4 ± 71.1
1-10	74.7	97.5	127.6	145.9	80.5 ± 33.9
11-19	36.5	47.0	58.2	66.8	38.8 ± 14.9
20-64	33.0	42.6	53.7	62.2	35.4 ± 13.8
65+	33.8	41.4	50.8	56.8	35.1 ± 11.5
All	37.0	51.3	76.0	99.0	44.8 ± 29.3
All Males	37.7	52.2	79.5	107.8	45.9 ± 29.1
All Females	36.6	50.6	71.9	93.0	43.9 ± 29.5
Tap Water					
< 1	39.4	66.7	106.3	141.4	53.2 ± 50.9
1-10	33.5	48.7	69.5	87.8	38.7 ± 23.8
11-19	16.9	23.7	32.1	39.4	18.4 ± 10.7
20-64	19.4	27.3	36.5	44.4	21.4 ± 12.2
65+	21.2	28.3	37.2	41.6	23.1 ± 9.7
All	**20.6**	**30.3**	**43.0**	**53.8**	**24.2 ± 17.0**
All Males	20.1	29.6	43.2	54.2	23.9 ± 16.6
All Females	21.1	30.9	42.9	53.2	24.5 ± 17.2

[a] Ershow & Cantor (1989). Assumes 1 mL = 1 g as originally reported.

Table 8.5 Water Intake Estimates For Pregnant Women, Lactating Women and Breast-Fed Children[a]

Group	N	50%	75%	90%	95%	$\bar{x} \pm$ SD
Total Water			**mL/day**			
Control	6201	1835	2305	2831	3186	1940 ± 686
Pregnant	188	1928	2444	3028	3475	2076 ± 743
Lactating	77	2164	2658	3164	3353	2242 ± 658
Breast-fed[b]	100	315	633	902	1023	402 ± 352
			mL/kg/day			
Control		30.5	38.7	48.4	55.4	32. ± 1
Pregnant		30.5	40.4	48.9	53.5	32.1 ± 11.8
Lactating		35.1	45.0	53.7	59.2	37.0 ± 11.6
Breast-fed[b]		48.8	78.8	122.3	155.4	55.7 ± 48.1
Tap Water			**mL/day**			
Control		1065	1503	1983	2310	1157 ± 635
Pregnant		1063	1501	2191	2424	1189 ± 699
Lactating		1330	1693	1945	2191	1310 ± 591
Breast-fed		89	249	351	468	153 ± 175
			mL/kg/day			
Control		17.3	24.4	33.1	39.1	19.1 ± 10.8
Pregnant		16.4	23.8	34.5	39.6	18.3 ± 10.4
Lactating		20.5	26.8	35.1	37.4	21.4 ± 9.8
Breast-fed		11.8	37.8	55.8	60.1	21.7 ± 25.4

[a] Ershow et al. (1991)
[b] Ershow & Cantor (1989)
Assumes 1 mL = 1 g as originally reported.

8.2.3 Canadian Study (CEHD, 1981)

This study, conducted in the summer of 1977 and the winter of 1978, involved 970 individuals in 295 households. Interview and questionnaire techniques were used to determine per capita intake of tap water in all beverages (water, tea, coffee, reconstituted milk, soft drinks, homemade alcoholic beverages, etc.). Patterns of water intake were analyzed with respect to age, sex, season, geographical location and physical activity. For the population as a whole the average intake of tap water and tap water-based beverages was 1.34 L/day and the 90th percentile was 2.36 L/day. Tap water consumption was observed to increase with age with the most rapid increase occurring in individuals less than 18 years old. The Canadian study was not used because the climate of Canada tends to be colder than California and the raw data necessary to determine distributional characteristics were not available.

8.2.4 High Activity Levels / Hot Climates

In their Exposure Factors handbook, U.S. EPA also addresses the issue of water consumption for those individuals performing strenuous activities under various environmental conditions, including desert climates (U.S. EPA, 1997). Data on these intake rates are very limited, and since the populations in the available studies are not considered representative of the general U.S. population, U.S. EPA did not use these data as the basis of their recommendations. Instead, they used the data from two studies to provide bounding intake values for those individuals engaged in strenuous activities in hot climates (McNall and Schlegel, 1968; U.S. Army, 1983).

McNall and Schlegel (1968) measured water intake of adult males working under varying degrees of physical activity, and varying temperatures. The results of this study indicate that hourly intake can range from 0.21 to 0.65 L/hour depending on the temperature and activity level. U.S. EPA notes that these intake rates cannot be multiplied by 24 hours/day to convert to daily intake rates because they are only representative of water intakes during the 8-hour study periods of the test protocol. Intakes of the subjects for the rest of the day are not known.

The U.S. Army has developed water consumption planning factors to enable them to transport an adequate amount of water to soldiers in the field under various conditions (U.S. Army, 1983 and 1999). According to their estimates, intake among physically active individuals can range from 6 L/day in temperate climates to 11 L/day in hot climates. The Army's water consumption planning factors are based on military operations and may over estimate civilian water consumption.

8.3 Modeled Distributions

8.3.1 Roseberry and Burmaster (1992)

Roseberry and Burmaster have fit lognormal distributions to some of the datasets of Ershow and Cantor (1989) discussed above. In tabulating the data they converted the units to mL/day and also adjusted the data to more closely approximate the age group distribution in the

U.S. population according to the latest Census figures (simulated balanced population). Table 8.6 gives the lognormal fits to the dataset most closely represented by Table 8.1 (i.e., all participants, all seasons, all regions). The values in the table are natural logarithms and could be used directly in a Monte Carlo simulation program such as Crystal Ball. In Table 8.7, the estimated percentiles from these modeled distributions are given for comparison with earlier tables. A comparison of Table 8.7 with Table 8.1 indicates that the modeled distributions are somewhat less skewed but overall fairly similar. Unfortunately the authors did not fit the model to the Western Regional data subset or the sex subsets. For all participants the best fits for total water and tap water intakes are the following lognormal distributions: exp (7.487 ± 0.405) and exp (6.870 ± 0.575) mL/day, respectively. The total water and tap water intake rates of simulated balanced populations can also be represented by lognormal distributions of exp (7.492 ± 0.407) and exp (6.864 ± 0.575) mL/day, respectively. The corresponding values for the 50th percentile of total water and tap water intake rates for all participants are 1785 mL/d and 963 mL/d, respectively. For the simulated balanced population the 50th percentile of total and tap water intake are 1794 mL/d and 957 mL/d, respectively.

Table 8.6 Summary of Best Fit Lognormal Distributions for Water Intake Rates (mL/day)[a]

Age Group	m	s	**R2**
Total Water			
< 1	1120.29	333.03	0.996
1-10	1393.82	487.93	0.953
11-19	1901.13	680.06	0.966
20-64	2085.99	868.91	0.977
65+	2096.03	779.69	0.988
All	1937.23	817.88	0.987
SBPb	1948.52	827.05	1
Tap Water			
<1	322.50	218.66	0.97
1-10	701.35	372.09	0.984
11-19	906.97	522.11	0.986
20-64	1264.66	657.30	0.956
65+	1341.16	676.32	0.978
All	1108.15	631.08	0.978
SBPb	1129.25	706.88	0.995

[a] Roseberry & Burmaster (1992)
[b] simulated balanced population

Table 8.7 Water Intake Estimates in mL/day from Modeled Distributions (Roseberry & Burmaster, 1992)

Age Group	2.5%	25%	50%	75%	97.5%	$\bar{x}$[a]
Total Water						
< 1	607	882	1074	1307	1900	1120
1-10	676	1046	1316	1655	2562	1394
11-19	907	1417	1790	2262	3534	1901
20-64	879	1470	1926	2522	4218	2086
65+	970	1541	1965	2504	3978	2096
All	807	1358	1785	2345	3947	1937
SBP[b]	808	1363	1794	2360	3983	1949
Tap Water						
<1	80	176	267	404	891	323
1-10	233	443	620	867	1644	701
11-19	275	548	786	1128	2243	907
20-64	430	807	1122	1561	2926	1265
65+	471	869	1198	1651	3044	1341
All	341	674	963	1377	2721	1108
SBP[b]	310	649	957	1411	2954	1129

[a] arithmetic mean
[b] simulated balanced population

8.4 Recommendations

8.4.1 Point Estimate Approach

The familiar default values of 2.0 L/day for an adult and 1.0 L/day for a child approximate the average intakes of total water and the 90th percentile of tap water intake observed in a number of independent studies when body weight is not taken into account. On a body weight basis, 2 L/day for a 70 kg body weight in the study used by Ershow and Cantor is approximately the 75th percentile on the distribution of Ershow and Cantor in Table 8.4.

The typical risk assessment in the Air Toxics "Hot Spots" program will likely look at a 9 year, 30 year and 70 year exposure duration. For the 9-year scenario, we recommend use of the mean and 95th percentile, 40 and 81 mL/kg BW-day, respectively, from the simulated distribution (Table 8.10; Figure 8.1) for the central tendency and high-end point estimates of water consumption rate. For the 30- and 70-year exposure scenarios, we recommend a time-weighted average tap water intake rate of 24 ml/kg-day as the central tendency estimate. This is the average tap water intake for all age groups (Table 8.4). For the 30- and 70-year scenarios, we recommend a high-end estimate of 54 ml/kg-day, which is the 95th percentile of tap water intakes for all age groupings (Table 8.4).

There may be circumstances where total water intake may need to be assessed, not just tap water intake. We have provided a distribution of total water intake for the readers' information. Mean and 95th percentiles may be used for appropriate age-groupings from Table 8.4 in assessing risks based on total water intake.

Table 8.8 Point estimates for tap water ingestion rates (mL/kg BW*day).

	9-Year Scenario (Children)	**30 and 70 Year Scenarios**
Average	40	24
High-end	81	54

8.4.2 The Stochastic Approach

While there are currently no ideal water intake distributions to use for California residents, the water intake rate distributions of Ershow and Cantor (1989) provide a reasonable basis for a stochastic assessment. We recommend the distribution for tap water for ages be utilized although in some cases values for both may need to be considered. Also chemical specific properties such as volatility may influence alternate route exposures via tap water e.g., by bathing, showering, flushing toilets, etc. In the Air Toxics "Hot Spots" program, these exposure routes are currently not considered. However, they are treated in Superfund risk assessments where ground water contamination is a larger issue. The following recommendations are based on currently available data. Depending on the nature of the analysis one or more of the recommendations may apply. Also when using distributions it is appropriate to truncate them to avoid impossibly large or small values. For drinking water ingestion, one and 99.9 percentiles would seem suitable limits based on the Ershow & Cantor data sets cited above.

8.4.2.1 Empirical Western Regional distributions of Ershow & Cantor

For the 30-year and 70-year exposure scenario, the tap water intake distribution summarized in Table 8.4 for "all" age groups is recommended to represent water consumption for the Air Toxics "Hot Spots" risk assessments. Roseberry and Burmaster (1992) did not fit the Ershow and Cantor (1989) Western Regional dataset to a lognormal model. In Table 8.9 we compared the empirical percentiles for tap water consumption for all in Table 8.4 with the percentiles of a lognormal model with mean and standard deviation of 24.2 ± 17.0. OEHHA therefore recommends using the lognormal parametric model, exp(2.99 ± 0.63), to assess the age 0-30 and age 0-70 year exposure scenarios.

Table 8.9 Comparison of Available Percentiles from Empirical Distribution with Lognormal Parametric Model.

	Mean	STD	Skew	Kurt-osis	p05	p10	p20	p30	p40	p50	p60	p75	p80	p90	p95
Empirical	24.2	17.0								20.6		30.3		43.0	53.8
Lognormal model			2.46	14.1	7.11	8.93	11.8	14.3	17.0	19.7	23.2	30.5	33.7	44.8	56.1

For the 9-year scenario, OEHHA simulated a distribution using the tap water distributions presented by Ershow and Cantor (1989) for children <1 year of age and for children 1 to 10 years of age using Crystal Ball®. This distribution is presented below in Table 8.10. The distribution was fitted to a lognormal parametric model with an arithmetic mean and standard deviation of 40.3 ± 21.6, $\mu \pm . \sigma$ is exp(3.57 ± 0.50). The Anderson Darling Statistic is 0.65. Thus the higher tap water intake rates of young children are incorporated into the distribution.

Table 8.10. Simulated tap water distribution for use in the 9-year exposure scenario (ML/kg body wt/day)

Mean	STD	Skew	Kurt-osis	p05	p10	p20	p30	p40	p50	p60	p70	p80	p90	p95
40.3	21.8	1.77	8.42	15.6	18.7	23.2	27.2	31.3	35.4	40.2	46.1	54.0	67.5	81.4

Figure 8.1 Simulated Water Consumption Distribution Ages 0-9 with Lognormal Parametric Model, Frequency Comparison

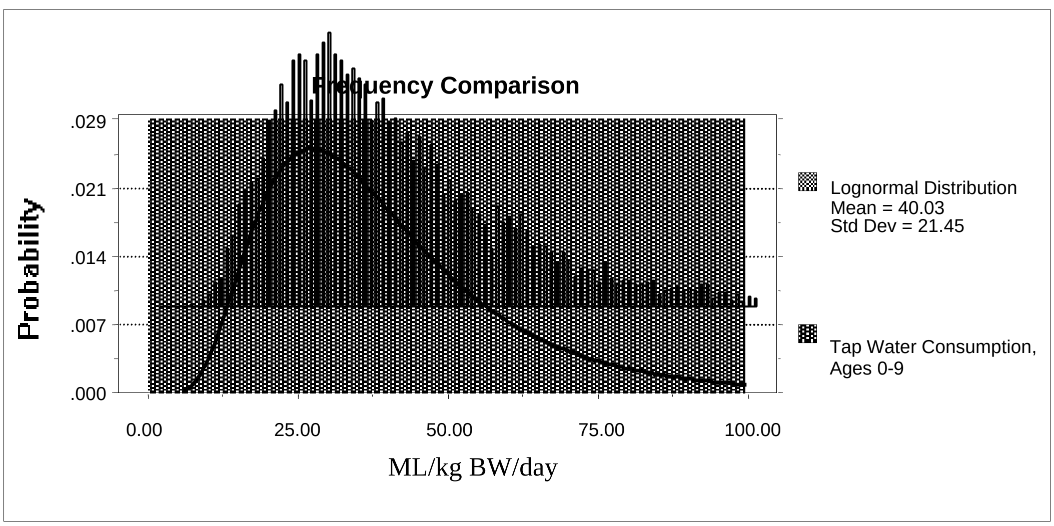


Figure 8.2 Simulated Water Consumption Distribution Ages 0-9 with Lognormal Parametric Model, Cumulative Probability Comparison.

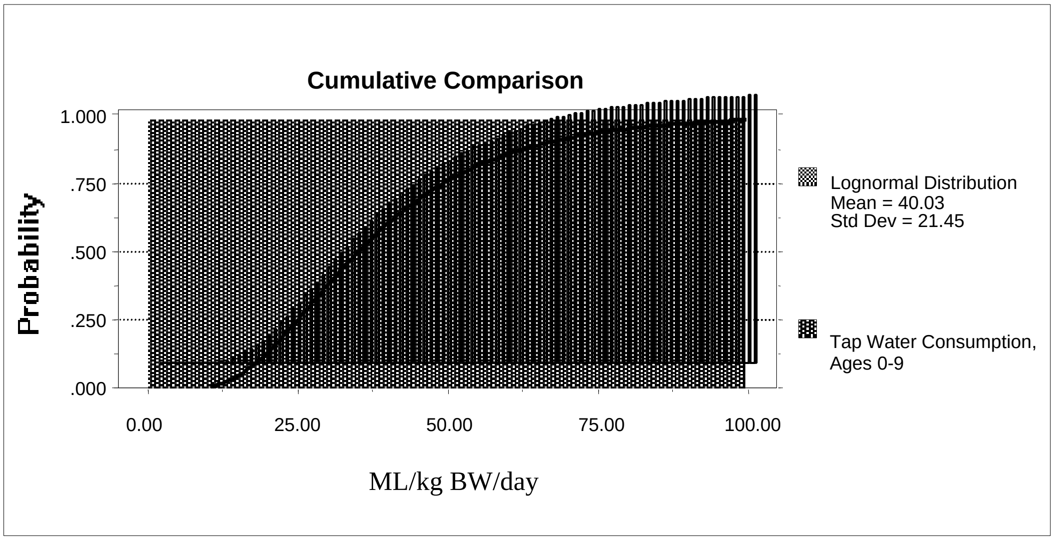
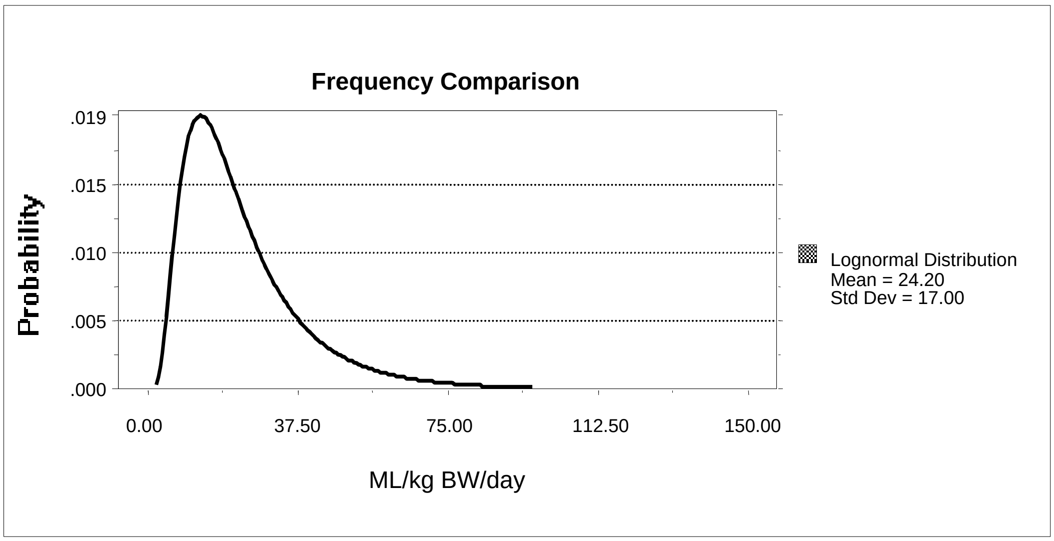


Figure 8.3 Lognormal Parametric Model Water Consumption Probability Distribution Ages 0-70



8.4.2.2 Pregnant, Lactating, Breast-fed Subpopulations

Comparison of water intake rates of potentially sensitive subpopulations of pregnant, lactating women and breast-fed babies in Table 8.5 (Ershow et al., 1991; Ershow & Cantor, 1989) with those in Table 8.4 indicate that the use of the values in Table 8.4 would be protective of these sensitive subpopulations.

8.4.2.3 High Activity Levels / Hot Climates

OEHHA is concerned that the high-end point estimate of 54 mL/kg-day (30- and 70-year scenarios) may not be sufficient to protect individuals living in extremely hot climates. Under such circumstances, OEHHA recommends using water consumption point estimates between 6-11 L/day, depending on the climatic conditions and activity levels. Expressed on a body weight basis, this is equivalent to 86-157 mL/kg BW/day, assuming an average adult male body weight of 70 kg. Specific data on water intake of children under these conditions were not available, therefore OEHHA recommends using the same estimates for the 9-, 30- and 70-year exposure scenarios.

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